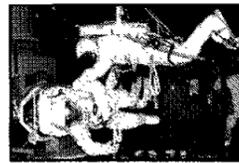




The second International Microgravity Laboratory mission is getting closer to launch day. Story on Page 3.



Space walk experts are getting ready to try out a new crew rescue device in September. Photo on Page 4.

Space News Roundup

Vol. 33

May 27, 1994

No. 21

Cool suit technology to aid multiple sclerosis patients

Scientists, engineers at JSC, Ames to collaborate with MS Association of America

NASA and the Multiple Sclerosis Association of America signed an agreement Monday to work collaboratively to advance the state of the art and application of cool suit technology for MS patients.

Scientists and engineers at JSC and Ames Research Center will work with members of the MSAA to enhance the performance of cool suits for this application. The Office of Life and Microgravity Sciences and Applications Extravehicular Activity Working Group, comprised of government, industry and academia, will lead the effort for NASA.

"This collaboration presents several unique opportunities for NASA and, most importantly, for MS patients," said NASA Administrator Daniel S. Goldin. "The MSAA and NASA hope

to advance cool suit technology to further relieve symptoms of thousands of MS patients nationwide."

More than 300,000 Americans, the majority of whom are women, are afflicted with this progressively disabling neurological disease that has no known cause, cure or prevention. Currently, about 1,000 MS patients use the current cool suit for systematic relief.

NASA's liquid cooled suit technology, called microclimate cooling, was developed for use as a space suit undergarment for cooling astronauts on the surface of the moon or during space walks.

"The wealth of technology that comes from the exploration of air and space is a valuable national resource and an investment in

America's future. Technology transfer is a fundamental mission of NASA," Goldin continued. "This collaborative effort is one in a series of initiatives to open our door to industry, academia and other organizations seeking to tap into NASA's high technology network."

The liquid cooled suit is a light-weight, head and vest garment that helps remove the heat generated by the body and lowers the overall temperatures by approximately one degree.

By using this suit, certain individuals with MS have reported some improvements with speech, vision, the use of arms and legs, and cognitive abilities.

Madlyn Rhue, actress, artist, native Washingtonian and MS patient, participated in Monday's event and demonstrated how

NASA's cool suit technology has relieved her symptoms and improved her quality of life.

The ceremony was held at the National Rehabilitation Hospital, the Washington, D.C. area's only rehabilitation facility. The hospital conducts research on cool suit technology and other advanced technologies to help MS patients reduce disabling symptoms.

Edward A. Eckenhoff, president and chief executive of NRH, led a tour of the hospital's unique facilities where doctors and MS patients discussed the research and benefits of the technology.

NASA's liquid cooled suit technology has found other applications in the medical field, including aiding patients who are born without

Please see **COOL**, Page 4



Lockheed employees checkout the first set of solar array modules for the International Space Station before they are shipped from the United States to Russia at the end of this month.

Station solar array modules off to Russia

The first set of solar array modules for the International Space Station program are ready to be shipped from the United States to Russia at the end of May.

The modules of interconnected solar cells are prototypes of flight units that will be delivered in September to be incorporated into advanced solar arrays for use on Russia's Space Station Mir. NASA and Russia's Space Agency are carrying out a joint program involving flights of the space shuttle to Mir and Russian participation in the International Space Station.

The advanced array, known as the Cooperative Solar Array, combines Russian flight proven structures and mechanisms with American advanced solar array modules to increase the available user electrical power on the station.

"This project combines the best technology from both the United States and Russia," said Randy Brinkley, manager of the International Space Station Program Office. "It represents one more milestone that shows how all the international partners are committed to building a world-class research

facility in space."

The modules will be delivered in two shipments. The first is tentatively scheduled to be sent Monday with the second shipment tentatively set for June 15. Once they arrive in Russia, NPO-Energia will validate the design and assembly procedures prior to launch of the photovoltaic arrays to Mir on the shuttle in October 1995 to support the joint shuttle/Mir space flights. The six arrays for the space station will be launched in 1998.

The Cooperative Solar Array
 Please see **SOLAR**, Page 4

Refitted Atlantis ready for return to Florida coast

By James Hartsfield

After more than a year and a half in California, *Atlantis* may be returned to Florida as early as today, outfitted with extensive upgrades, inspections and modifications as well as equipment that will allow the orbiter to dock with Russia's Mir space station next year.

Atlantis has been at Rockwell's Palmdale, Calif., shuttle factory and all work on the orbiter has proceed-

ed on schedule, with the actual delivery back to Florida occurring two weeks ahead of what was originally planned. *Atlantis* is hoped to make the cross country trip atop the 747 Shuttle Carrier Aircraft in one day, making only one stop to refuel en route. If weather conditions permit, the piggy-back orbiter could stop in Houston at Ellington Field for a few hours, however, the decision on a route to be taken will be made as the flight progresses.

For the latest updates on the ferry flight plans and any possible Houston stop, employees may call a recorded message on the JSC Employee Information Service at x36765.

Once at KSC, *Atlantis* will be moved into the Bay 3 processing hangar to be prepared for a launch carrying the third Atmospheric Laboratory for Applications and

Sciences-3 on STS-66 in October.

The enhancements made to *Atlantis* include upgrades that will allow it to fly Extended Duration Orbiter flights of two weeks or longer; improved nose wheel steering; installation of a drag chute; installation of improved auxiliary power unit connections; and the addition of a fifth set of hydrogen and oxygen tanks for the electrical power generation system. Other

work included the modifications to allow docking with the Mir and a host of inspections and checks performed on each shuttle orbiter about every three years.

Meanwhile, preparations of *Columbia* for the next shuttle flight, STS-65 in early July, are proceeding smoothly in KSC's Bay 2 hangar. This week, the

tunnel that will connect *Columbia's* crew cabin with the International Microgravity Laboratory-2 was installed and checked for leaks. Also, technicians are closing out work on the midbody, aft engine compartment and IML-2 Spacelab module. Other work included checks of the landing gear and a final cleaning of the cargo bay. *Columbia* is to be moved to the Vehicle Assembly Bldg., hoisted vertical and attached to the STS-65 solid rockets and fuel tank during the second week of June.



Hubble observes pair of stellar explosions

NASA's Hubble Space Telescope has returned valuable new images of the inner regions of the "whirlpool galaxy" and a mysterious mirror-imaged pair of rings of glowing gas encircling supernova 1987A.

HST provided the best images yet of the rings around 1987A, which led to a new interpretation of how the rings were formed. One possibility is that the two rings might be "painted" by a high-energy beam of radiation or particles, like a spinning light-show laser beam tracing circles on a screen.

A supernova is a violent stellar explosion that destroys a star, while ejecting the products of nuclear burning into the gas between stars. Debris from supernova explosions play a central role in increasing the

heavy element abundance of galaxies. The material that makes up the Sun, the Earth, and our bodies was once inside stars that exploded long before the solar system formed about five billion years ago.

The source of the radiation might be a previously unknown stellar remnant that is a binary companion to the star that exploded in 1987. Images taken by Hubble show a dim object in the position of the suspected source of the celestial light show.

"The Hubble images of the rings are quite spectacular and unexpected," said Dr. Chris Burrows of the European Space Agency and the Space Telescope Science Institute in Baltimore, Md. Burrows used Hubble's Wide Field Planetary Camera 2 to image the rings in

February 1994.

The striking HST picture actually shows three rings. The smaller "center" ring of the trio had been identified previously. The larger pair of outer rings also were seen in ground-based images, but the interpretation was not possible until the higher resolution Hubble observations.

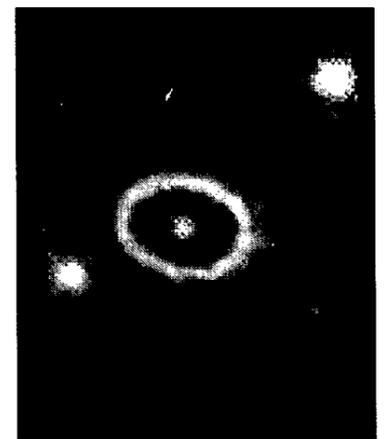
Though all of the rings probably are inclined to our view (so that they appear to intersect), they probably are in three different planes. The small bright ring lies in a plane containing the supernova; the two rings lie in front of and behind it.

To create the beams illuminating the outer rings, the remnant would need to be a compact object such as a black hole or neutron star with a

nearby companion. Material falling from the companion onto the compact object would be heated and blasted back into space along two narrow jets, along with a beam of radiation. As the compact object spins, it might wobble or precess about its axis, like a child's top winding down. The twin beam would then trace out great circles like jets of water from a spinning lawn sprinkler.

If the rings are caused by jets, however, the beams are extremely narrow (collimated to within one degree). This leads Burrows to conclude: "This is an unprecedented and bizarre object. We have never seen anything behave like this before."

The jet model explains why the
 Please see **HUBBLE**, Page 4



NASA Photo

This Hubble Space Telescope image shows three rings of glowing gas encircling the site of supernova 1987A, a star that exploded in February 1987. The supernova is 169,000 light years from Earth.

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m.-3 p.m. Friday. For more information, call x35350 or x30990.

Astros Games: Tickets for the June 12 Astros vs. Atlanta Braves game are on sale until May 25. Cost is \$12 for mezzanine seating. Game begins at 1:35 p.m. Tickets also are available for the Astros vs. Cubs game at 1:35 p.m. July 3. Cost is \$14 for field level seating. Tickets are on sale until June 17.

Six Flags: Tickets available for one-day weekend and weekday admission. Cost is \$20.95 for weekend and \$16.75 for weekday. Two-day admission, either weekend or weekday, is \$27.25.

Seaworld of Texas: Discount tickets: adult \$20.95; child (3-11), \$14.25.

Fiesta Texas: Discount tickets: adult \$18.95; child (4-11) and seniors (55+), \$14.25.

Splash Town: Discount tickets, \$11.05.

Waterworld: Discount tickets, \$10.50.

Astroworld Early Bird: Tickets available for one-day admission for 1994 season. Cost is \$16.75 per person. Tickets must be purchased by May 31.

Moody Gardens: Discount tickets for two of three different attractions: \$9.50

Space Center Houston: Discount tickets: adult, \$7.95; child (3-11), \$4.75; commemorative, \$9.55.

Metro tickets: Passes, books and single tickets available.

Movie discounts: General Cinema, \$4.75; AMC Theater, \$4; Loew's Theater, \$4.50.

Stamps: Book of 20, \$5.80

JSC history: *Suddenly, Tomorrow Came: A History of the Johnson Space Center*, \$11.

Upcoming events: Country western dance from 7:30 p.m.-midnight June 25 at the Gilruth Center. Cost to attend is \$15. Tickets on sale June 1 through June 22.

JSC

Gilruth Center News

Sign up policy: All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a NASA badge or yellow EAA dependent badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x30304. New badging hours go into effect June 1.

EAA badges: Dependents and spouses may apply for photo identification badges from 6:30-9 p.m. Monday-Friday; 9-11 a.m., 1-3 p.m. and 6:30-9 p.m. Wednesdays; and 8 a.m.-4 p.m. Saturdays. Dependents must be between 16 and 23 years old.

Weight safety: Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. June 2. Pre-registration is required. Cost is \$5.

Defensive driving: Course is offered from 8:15 a.m.-3 p.m. Saturday. Next class is June 11. Cost is \$19.

Aerobics: High/low-impact class meets from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Aikido: Martial arts class meets from 5-7:30 p.m. Tuesdays and 6:15-8:15 p.m. Wednesdays. Black Belt class from 6-8 p.m. Fridays, requires instructor permission. Cost is \$25 per month. New classes begin the first of each month.

Sailing Club: Sailing lessons are planned for May and June. For information, contact Richard Hoover at x31360 or 996-7716.

Golf lessons: Lessons for all levels. Cost is \$90 for six weeks. For information, contact x33345.

Basketball tournament: Three-on-three basketball tournament is June 4. Cost to register is \$40 per team. For additional information, call x33345.

Fitness program: Health Related Fitness Program includes a medical examination screening and a 12-week individually prescribed exercise program. For more information, call Larry Wier at x30301.

JSC

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Ads may be run only once. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2. No phone or fax ads accepted.

Property

Lease: Webster condo, 2-1, clean, large, FPL, all appliances, W/D conn, patio, storage, grey carpet, \$495/mo. x31275 or 486-0315.

Sale: Nacogdoches, Tx, brick, 3-2.5-2, 3013 sq ft, on 3/4 acre, GHA, FPL, screened patio, outdoor patio, 20' x 30' workshop w/garage and storage, \$110k. 486-9206 or (409) 560-6537.

Sale: Oakbrook West, 4-2-2, completely updated, lg yard w/trees, \$99.5k. Denise, x31846 or 486-5146.

Sale: Bay Forest patio home, 3-2-2, all upgrades, cul-de-sac, \$150k. x33075.

Sale: Village Grove, 2 story, 3-4 BR, 2.5 bath, huge 2-story deck w/storage, cul-de-sac, above ground 4 ft pool, \$128.9k. 487-9510.

Rent: Countryside, 3-2-2A, split BR plan, \$850/mo. Frank, x48778 or 332-7383.

Sale: TH, 2-2.5-2C, 24 hr sec guard, club atmosphere, lake view. 474-2339.

Sale: Crosby, no approval assumption, 3-2-2, game rm, both formal, 2200 sq ft, landscaped. 328-6663, pager 760-7104.

Sale: Galveston condo, on sea wall, gulf view, owner financing, furnished, ex cond, \$28.9k. Pete, 532-4237.

Sale: Hill County, 10 acres, recorded msg, (409) 925-8770.

Rent: Clear Lake, lg 2 BR condo, new paint, carpet, ceiling fans, W/D connections, pool, water paid, \$475 plus dep. 326-1761.

Lease: Baywind II condo, 2-2 split plan, W/D, avail June 1, \$585/mo plus \$585 dep. Pete, x38614 or 480-4028.

Sale/Lease: CLC TH, 3-2-2, W/D conn, sec, FPL, Jacuzzi, non-qual assumable, \$80k or \$980/mo. 486-6880.

Sale: Brook Forest, 4-3.5-2, 3600 sq ft, pool, game rm w/pool table, sec sys, \$196k. 486-6880.

Sale: Friendswood, 4-2.5-2+, 2173 sq ft, lg living area w/FPL, Jacuzzi in master bath, formal DR, ceiling fans, sec sys, 2 yrs old, cul-de-sac, \$105.9k. 992-1466.

Sale: Dickinson, 4/3-2-1, 2100 sq ft, 3 lots w/trees, 10 ft ceilings, \$69k. Cindy, 282-4286.

Sale: Ft. Lauderdale, FL, luxurious condo, unique time share, 300 ft off Atlantic, world wide accom, yacht and tennis club, \$10k. x36851.

Friendswood, 4-2-2, 1.5 ac lot, trees, 7% assumption fixed, \$123.5k. Mark, x38013 or 992-4132.

Sale/Lease: Friendswood, Wedgewood Village, 3-2-2, ceiling fans, FPL, book shelves, trees, marble entry, lg LR, \$65k or 750/mo. 482-0874.

Rent: Lake Livingston waterfront, 3-3, furn, pool, tennis, boat launch, 24 hr sec, \$650/wk, \$340/wknd. (409) 762-6601.

Cars & Trucks

'84 Mercury Brougham SW, PS, PB, A/C, AM/FM/cass, elec seat, good tires, good cond, \$1700. L.D., x48767 or 480-5681.

'88 Honda Prelude, A/C, AM/FM cass, 5 spd, sun roof, 63k mi, new tires, PS, PB, ex cond,

\$6750. L.D., x48767 or 480-5681.

'85 Chrysler LeBaron GTS, loaded, many new parts, needs PS repair, \$1750 OBO. x34072.

'76 Jaguar XJ12L, Chev V8 conversion, A/C, PS, PB, auto, tinted windows, Alpine AM/FM/cass, ex cond, \$6500 or trade for PU or '69/'70 Mustang of equal value. x40235.

'88 Plymouth Voyager LE mini van, ex cond, black w/wood grain side trim, all pwr. 641-5315.

'78 Chevy PU, rusty, engine knocks, \$600 nego. 470-2068.

'84 Ford Mustang GT, auto, 5.0L V8, A/C, rebuilt trans, \$1.5k. Dena, x45122 or 332-6477.

'87 Mazda 626 LX, 4 dr, auto, loaded, low mi, one owner, ex cond, \$5k nego. 488-8588.

'90 LeBaron convertible, rew w/white top, grey velour int, ex cond, \$9990. 480-9102 or 612-1135.

'82 Camaro, A/C, auto, 2.8L V6, AM/FM stereo/cass, brown/beige, clean, ex cond, low mi, \$2000 OBO. 991-5280.

'73 Ford Mustang, red, \$1800. Darren, x33259 or 337-2493.

'92 Buick LaSabre, 58k mi, 100k 0-deductible warr, \$11k + driveable trade or \$12.5k. 482-6236.

'91 Mazda Miata, blue, w/hard top, standard 5 spd, PS, PB, custom wheels, ex cond, 20k mi, \$12.5k. 554-9250.

Boats & Planes

Laser sailboat, 13'-11" LOA, 76 sq ft sail, centerboard, no trlr, best offer. Jerry, x35226 or 333-2778.

Chaparral 187, 140hp Mercruiser I/O, SS prop, electronics, ex cond, \$5700. x37954 or 481-1605.

22.5' Sea Ray Cuddy Cruiser, 228hp I/O, tandem galv trlr, good cond, \$6.5k Mark, x38013 or 992-4132.

'90 Hunter 30' aux sloop, A/C, roller furling, full batten main, digital knot/depth/wind, auto pilot, bimini, ex cond, \$49.5k. 980-7481.

Chrysler 22' sailboat, sleeps 6, galley, head, fixed keel, 5hp O/B, mainsail, 2 jibs, ex cond, slip in Clear Lake, \$2500. 282-1727.

'91 Cajun 18.5' center console bay boat, '93 135hp Mercury Pt/T, Motorguide trolling motor, \$10.5k. Gary, 534-3080 or 534-3080.

Cycles

'82 Kawasaki 550-C3/Ltd, 18k mi, ex cond, garaged, \$1200. 333-8140 or 485-0204.

Two Diamond Back mountain bikes, 16" and 18", ex cond, were \$400 ea, now \$400 both. x47090 or (409) 986-6641.

Girls' 12" bicycle, \$15. 554-4851.

Women's 27" 10 spd bicycle, ex cond, \$100. Rick, 484-3216.

Boys' 20" bicycle, ex cond. 486-7909.

Audiovisual & Computers

Trande new \$1295 fax modem, 19,200 bps V.32 Turbo for Macintosh or Powerbook OBO, upgradable to V.Fast. Tony, x47401 or 482-4156.

386 DX-16, 3MB/70MB HD, 1.2 and 1.44MB FD, VGA, 14" IBM color monitor, DOS, Windows, \$425. Kelley, x36818 or 488-8194.

IBM 286 AT, 1MB/20MB HD, 1.2MB FD, 14" color monitor, \$85. Kelley, x36818 or 488-8194.

Pioneer receiver, 40W, cassette deck, Technics CD player, Realistic 10 band equalizer, Advent Tower speakers, \$400 OBO. 941-5288.

EGA monitor and cards, \$100; 1200 bps modem, \$10; 2400 bps modem, \$20; OS2 software, \$50; Windows 3.1 software development kit, \$100. Terry, x36351.

Today

Cafeteria menu — Special: tuna noodle casserole. Total Health: steamed salmon steak. Entrees: steamed salmon steak, roast beef, baked chicken, steamed fish, Reuben sandwich. Soup: seafood gumbo. Vegetables: French cut green beans, cauliflower with cheese, green peas, black-eyed peas.

Monday

Memorial Day — Most JSC offices will be closed in observance of the Memorial Day Holiday.

Tuesday

Cafeteria menu — Special: fried chicken. Total Health: vegetable lasagna Entrees: Salisbury steak, steamed pollock, vegetable lasagna, French dip sandwich. Soup: split pea and ham. Vegetables: mixed vegetables, French cut green beans, pinto beans, vegetable sticks.

Wednesday

Cafeteria menu — Special: stuffed bell pepper. Total Health: stuffed bell pepper with creole sauce. Entrees: fried catfish with hush puppies, stir-fry chicken and rice, wieners and beans, Reuben sandwich. Soup: seafood gumbo. Vegetables: buttered rice, Italian green beans, corn O'Brien, peas and carrots.

Thursday

AIAA meets — The Houston section of the American Institute of Aeronautics and Astronautics presents its annual awards banquet at 5:30 p.m. June 2 at Space Center Houston. Kumar Krishen will discuss "Perspectives on Technology." For reservations and information, contact

Frankie Hap, 333-6064; Ardell Broussard, 283-1040; Mary Ann Bivona, 483-1350; or Sarah Leggio, 282-3160.

Blood drive — Loral will host a blood drive from 7-11:30 a.m. in the east parking lot at Loral Bldg. 1, 1322 Space Park Drive and from 1:30-4:30 p.m. in the rear parking lot at Loral Bldg. 11, 1816 Space Park Drive. For an appointment, call 335-5090.

Cafeteria menu — Special: barbecue smoked link. Total Health: roasted turkey breast. Entrees: turkey and dressing, beef stroganoff, chopped sirloin, French dip sandwich. Soup: tomato Florentine. Vegetables: Lima beans, buttered squash, Spanish rice, oriental vegetables.

Friday

Awards banquet — The Clear Lake Council of Technical Societies presents its 11th annual awards banquet at 5:30 p.m. in the Gilruth Center. Lifetime Achievement awards will be presented to former JSC Director, Aaron Cohen and Carolyn Sumners of the Houston Museum of Natural Science. Cost to attend is \$17 and reservations must be made by May 31. For reservations and additional information, contact Marcia Taylor at x30195.

Cafeteria menu — Special: meat sauce and spaghetti. Total Health: spaghetti noodles with turkey meat sauce. Entrees: rainbow trout, liver and onions, beef cannelloni, pork and shrimp egg roll, Reuben sandwich. Soup: seafood gumbo. Vegetables: steamed broccoli, breaded okra, cut corn, black-eyed peas.

June 7

Blood drive — Loral will host a

blood drive from 8-11 a.m. in front of Loral Bldg. 3, 3700 Bay Area Blvd. and from 1:30-3:30 p.m. at Loral/ Marina Plaza in South Shore Harbour. For an appointment, call 335-5090.

June 8

PSI meets — The Clear Lake/ NASA Area chapter of Professional Secretaries International meets at 5:30 p.m. June 8 at the Holiday Inn on NASA Road 1. For additional information, contact Elaine Kemp, x30556 or Diana Peterson, x30390.

June 21

Blood drive — Barrios Technology will host a blood drive from 8-11:30 a.m. at 1331 Gemini. For an appointment, call Tom Hanson, 244-7473.

July 4

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July 21

Apollo anniversary — A 25th anniversary splashdown party is planned from 4:30-7:30 p.m. July 21 at the Gilruth Center. Cost is \$3 per person. Last day to purchase tickets is July 15. For additional information, contact the Gilruth Center at x33345.

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'87 Mazda 626 LX, 4 dr, auto, loaded, low mi, one owner, ex cond, \$5k nego. 488-8588.

'90 LeBaron convertible, rew w/white top, grey velour int, ex cond, \$9990. 480-9102 or 612-1135.

'82 Camaro, A/C, auto, 2.8L V6, AM/FM stereo/cass, brown/beige, clean, ex cond, low mi, \$2000 OBO. 991-5280.

'73 Ford Mustang, red, \$1800. Darren, x33259 or 337-2493.

'92 Buick LaSabre, 58k mi, 100k 0-deductible warr, \$11k + driveable trade or \$12.5k. 482-6236.

'91 Mazda Miata, blue, w/hard top, standard 5 spd, PS, PB, custom wheels, ex cond, 20k mi, \$12.5k. 554-9250.

Citizen GSX-140 Plus, 24 dot matrix printer, color compatible, ex cond, was \$300, now \$100. Jay, 481-2335.

Paving the Way

Two-week flight adds impetus for station, broader cooperation

As launch day nears for the STS-65 International Microgravity Laboratory-2 mission, the astronauts who will spend 14 days furthering microgravity and life sciences investigations are entering their final phase of training.

IML-2 will continue to lay the groundwork for broader international partnerships and scientific alliances that will continue during future global endeavors.

Last Friday, the crew participated in the crew equipment interface tests at Kennedy Space Center, checking out the operations of the Spacelab module that will serve as an orbiting workshop aboard the Space Shuttle *Columbia*. The crew now moves into its joint integrated simulation timeline, which will pull together the Spacelab management team at Marshall Space Flight Center, the flight control team at JSC, and the crew.

The crew includes Commander Bob Cabana, Pilot Jim Halsell, Payload Commander Rick Hieb, and Mission Specialists Leroy Chiao, Don Thomas and Carl Walz. Payload Specialist Chiaki Mukai will become the second Japanese citizen to fly aboard an American spacecraft, following in the footsteps of Mamoru Mohri, who flew aboard *Endeavour* on STS-47 in September 1992.

"We are two months to go, so I am very much excited and very much looking forward to going to space and working in space and getting very good science results," Mukai said. "We have been working hard and getting busier and busier, but it's fun."

"We've been training for a long time, I think we've been at it 19 months now, the payload crew has," Chiao said. "We're pretty anxious to go, and we feel very confident. We've

still got some refresher training and some training with the orbiter, but as far as the experiments go I think we've got a real good handle on it."

The seven-member crew will work on experiments prepared by NASA, the Canadian Space Agency (CSA), the European Space Agency (ESA), the French Space Agency (CNES), the German Space Agency (DARA) and the National Space Development Agency of Japan (NASDA), which Mukai represents. Some 200 scientific investigators are involved.

"There are more than 80 experiments, and seven international space agencies involved. So from an operational viewpoint it is very hard to meet everybody's requirements," Mukai added. "People thought this was going to be the last Spacelab mission, so they put in everything they could come up with. It's kind of hard to handle, but on the other hand, if we can handle this mission it's going to be a very good precursor for the future space station program."

Half of the IML-2 investigations will involve microgravity processing and half life sciences.

The processing studies will use furnaces and other facilities to produce a variety of material structures from crystals to metal alloys. They will look at how bubble formation and migration, surface tension forces, thermal gradients and other parameters affect material development in microgravity. They also will study fluid processes such as thermocapillary flows and critical-point phase transitions. Nearly every physical science depends on an understanding of these basic mechanisms, and the knowledge gained on IML-2 may help develop the next generation of materials for high-tech applications.



"We're looking at developing new processes and developing new materials in space that we might apply here on the ground. We're learning how to process the material with new properties in space and maybe bringing that knowledge back to Earth and replicating it here," said Thomas, a materials scientist. "I don't think we're at the point yet where we're ready to build space factories to produce materials, but we sure can learn a lot up there that we can bring back and apply to Earth-based processes to make better materials here."

The life sciences research will help reveal the role of gravity in shaping life as we know it and help explain how living organisms react and adapt to microgravity and increased radiation of the space environment. Growth patterns, genetic material, bone development, cell differentiation and reproduction, and readaptation to gravity will be studied. This knowledge is crucial if people are to live and work safely and productively in space for long periods of time. In addition, the tests the IML-2 payload crew members conduct on themselves will study changes in the shape of their spines and the adaptation of their hearts and circulatory systems in microgravity.

"In the past, crew members have been able to sort of specialize on experiments," Hieb said. "On this mission, we have 80 experiments

and we have cross-trained for almost every one of those. There are going to be many times during the course of a day when I start out working on a particular experiment and then there will be a break where that processes on its own for a while. I'll shift over to do something else and then Chiaki will pick up where I left off maybe 15 minutes later. She'll work it for a while and we'll be going back and force like this, following each other's tracks all the time, so it will be a real change to us to keep focused."

"The difficulty in this flight will be managing two shifts of people who are trying to run continuous experiments and have to hand off the information from one shift to the next in a very timely fashion without losing anything," Halsell agreed. "For the

experiment people and the orbiter systems guys, that will be the most difficult part of the flight."

The microgravity tests will involve materials science, fluid science and microgravity environment and countermeasure studies.

"We've improved some experiments; we're flying some experiments for the first time. We're building on experiences we had on Spacelab, IML-1, USML, Spacelab-J. It's a building block to get us to our space station in the future," Cabana said.

Materials science experiments will use the Large Isothermal Furnace, which had a precursor on Spacelab-J, and the Electromagnetic Containerless Processing Facility, making its first flight. LIF and TEMPUS, which uses electro-magnetism to position samples, will be used to study a variety of metals and alloys.

Fluid scientists will use the Bubble, Drop and Particle Unit, making its first flight, and the Critical Point Facility, which flew on IML-1. BDPU will study the interfacial processes of bubbles, drops and particles in microgravity, and the CPF will study the temperature and pressure transition point for states of matter, such as when a liquid becomes a gas.

Microgravity environment and countermeasure research involving the Space Acceleration Measurement System, which flew on SLS-1, IML-1, USML-1, Spacelab-J and USMP-1, the Quasi-Steady Acceleration Measurement System and the Vibration Isolation Box Experiment System, both making their first flights. SAMS, and QSAM will characterize the magnitude and frequency of accelerations that affect

microgravity work on the shuttle, and VIBES will test a method of counteracting the effects of such accelerations.

"We'll be in a near gravity-gradient condition, where the tail will be pointed toward the Earth," Walz said. "We'll try to minimize the amount of perturbations. For example, we have a new isolation system for our exercise bicycle, the ergometer, to try to reduce any vibration at all from that device and we have a set of accelerometers on board to measure."

The life sciences experiments will involve bioprocessing, space biology, human physiology and radiation biology experiments.

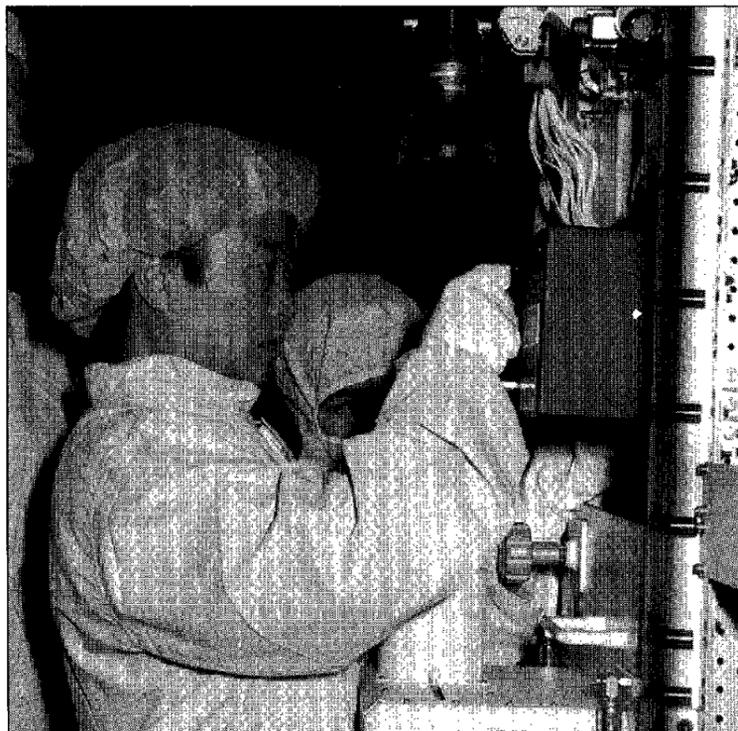
Bioprocessing work will use the Advanced Protein Crystallization Facility, which flew on Spacehab, the Free-Flow Electrophoresis Unit, which flew and Spacelab-J, and the Applied Research on Separation Methods Using Space Electrophoresis, making its first flight. APCF, will produce a variety of protein crystals, and FFEU and RAMSES will use a free-flowing solution to separate biological materials into individual components using an electric field.

Space biology work will involve the Aquatic Animal Experiment Unit, which had a precursor on Spacelab-J, the Biorack, which flew on Spacelab-D1 and IML-1, the Slow Rotating Centrifuging Microscope, making its first flight, and the Thermoelectric Incubator and its Cell Culture Kits, which had precursors on IML-1. AAU, BR, NIZEMI and TEI/CCK, with devices such as microscopes and centrifuges, will be used to study the effects of microgravity on biological specimens ranging from fish and plants to single cells of a variety of animals and plants.

Human physiology studies will utilize the Extended Duration Orbiter Medical Project instruments that flew on USML-1 and Spacelab-J, and the Spinal Changes in Microgravity experiment, which had a precursor on IML-1. EDOMP and SCM together form a battery of tests to study the effects of long space missions on humans, trying out countermeasures designed to decrease the difficulty of returning to Earth's gravity, and to determine how the spine changes in microgravity. Many astronauts have complained of backaches during space flight.

Radiation biology work will use the Biostack, which flew on Spacelab-1, Spacelab-D1 and IML-1, and the Real-Time Radiation Monitoring Device, making its first flight. BSK and RRMD will make precise measurements of the radiation environment inside the Spacelab and test ways of forecasting the amount of space radiation that will be seen on future spacecraft. □

Top: Six NASA astronauts and a Japanese payload specialist will comprise the crew of the STS-65 International Microgravity Laboratory-2 flight. From left are Mission Specialists Rick Hieb and Leroy Chiao, Pilot Jim Halsell, Commander Bob Cabana, Payload Specialist Chiaki Mukai, and Mission Specialists Don Thomas and Carl Walz. Mukai represents the National Space Development Agency (NASDA). Right: In the Operations and Checkout Bldg. at Kennedy Space Center, Payload Specialist Chiaki Mukai examines elements of the IML-2 Spacelab. She was at KSC with other members of the flight crew to gain familiarity with the hardware.



NASA assumes responsibility for developing Landsat 7

NASA is assuming the satellite-development contract for Landsat 7, which will provide remote-sensing data critical to understanding environmental change.

The contract with Martin Marietta Astro Space, Valley Forge, Pa., will now be managed by Goddard Space Flight Center.

Landsat 7 also will support a broad range of other important Earth science and Earth-resource applications from the Department of Defense. The Landsat program has provided more than 20 years of calibrated data to a broad user community of resource managers, global-change researchers, state and local governments, commercial users and the military. Landsat data have been used, for example, to refine estimates of deforestation in the Amazon Basin.

NASA assumes satellite development following the Administration's

reevaluation of the program, led by the Office of Science and Technology Policy. Under the existing joint program office, DOD had primary responsibility for satellite development and launch, and NASA had primary responsibility for the ground system and data distribution.

The new program was implemented May 5 under a Presidential Decision Directive signed by President Clinton. NASA will have responsibility for development and launch of the satellite. The National Oceanic and Atmospheric Administration and NASA will jointly develop the ground system, which NOAA will operate. The Earth Resource Observation Satellites Data Center, Sioux Falls, S.D., of the Department of Interior's U.S. Geological Survey will continue to be responsible for maintaining the government's archive of Landsat and other related remotely sensed data.

The existing program was reevaluated after changing national security concerns led to DOD's determination that Landsat 7 would not meet its needs. DOD's withdrawal from the program, together with the failure of NOAA's Landsat 6 to reach orbit in October 1993 and the advanced age of Landsats 4 and 5, led the Administration to reassess the program.

The outcome of the OSTP's assessment is a new strategy designed to continue the Landsat program and extend the 20-year Landsat data set. The estimated cost of the restructured program (development and operations), including \$230 million already spent, is \$754.7 million, about \$125 million less than the joint NASA-DOD program. Launch of Landsat 7 is planned for December 1998.

Landsat 7 is expected to be the functional equivalent of NOAA's Landsat 6, with enhancements to the

spacecraft. Landsat 6 carried an Enhanced Thematic Mapper (ETM), which would have provided images of the Earth's surface with resolution as good as approximately 15 meters (50 feet) in one band plus 30 meters (100 feet) resolution in six bands covering the visible, near and short-wave infrared regions. Landsat 7 will carry an ETM-Plus, under development by Hughes Santa Barbara Research Center, Calif., which will provide modest improvements over Landsat 6, primarily in instrument calibration and accuracy.

Landsat 6 was intended to replace the existing Landsats 4 and 5. Launched in 1982 and 1984 respectively, Landsats 4 and 5 are operating well beyond their three-year design lives, and represent the only source of global, calibrated high spatial resolution measurements of the Earth's surface that can be compared to previous data records.

Landsat 7 is part of NASA's Mission to Planet Earth, dedicated to studying how our global environment is changing. Using the unique perspective available from space, NASA is observing, monitoring and assessing large-scale environmental processes, with an emphasis on climate change. MTPE satellite data, complemented by aircraft and ground data, are enabling us to better understand environmental changes, to determine how human activities have contributed to these changes and to understand the consequences of such changes. MTPE data, which NASA is distributing to researchers worldwide, are essential to humans making informed decisions about protecting their environment.

The Landsat 7 spacecraft development is managed by GSFC for NASA's Office of Mission to Planet Earth.

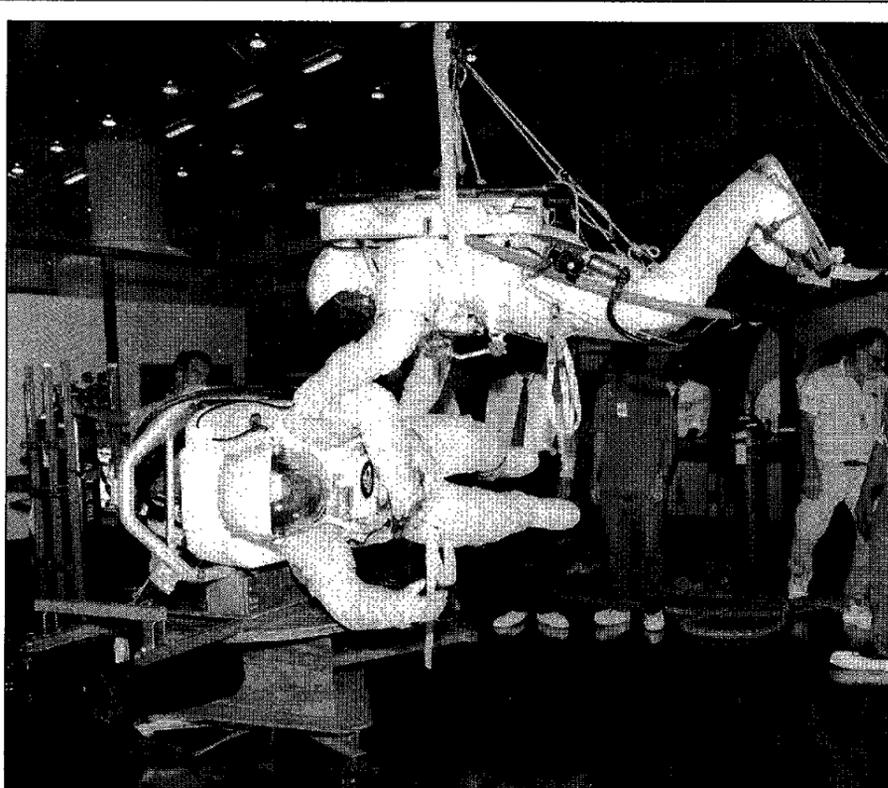
Simulation lab alumni set reunion

The search is on for current and former employees of the employees in the Space Environment Simulation Laboratory interested in attending a reunion of the workers who performed thermal vacuum testing on a variety of spacecraft from Gemini through space shuttle.

The Oct. 15 reunion is set for the Gilruth Center and will allow SESL alumni to celebrate their successful programs, including Apollo, Skylab, Apollo-Soyuz, and Shuttle. Plans for the reunion are under way and attempts to contact employees are ongoing.

People interested in attending the seminar should send their name, address and phone number of Southwest Seminars Association (SESL Reunion), Post Office Box 890228, Houston, TX 77289-0228. Attendees also should include the name of the organization they were with during testing, what hardware testing or facility support they were involved with, and the dates they were with SESL.

For additional information on the reunion, contact Richard Hermling at x31287.



JSC Photo by Mark Sowa

OUT FOR A SPIN—Scott Bleisath, in top space suit, prepares to start fellow extravehicular activity engineer Mike Hess spinning on the air-bearing floor in Bldg. 9 during a Simplified Aid for EVA Rescue exercise. The pair was developing techniques by which the non-SAFER equipped space walker will impart a rotation to the SAFER space walker during the STS-64 mission, scheduled for September. Once the SAFER-equipped astronaut is spinning, the device will be activated and its automatic attitude hold capability will be tested.

Technical societies to honor Cohen's lifetime of work

Former JSC Director Aaron Cohen is set to receive a lifetime achievement award this week from the Clear Lake Council of Technical Societies.

The 11th annual awards banquet is planned for 5:30 p.m. Friday at the Gilruth Center. Joining Cohen in receiving the award recognizing support of local technical activities is Carolyn Summers of the Houston Museum of Natural Science.



Cohen

Cohen retired as JSC director in August 1993 to become Zachry Professor of Engineering at Texas A&M University. He joined NASA in 1962 and served in key leadership roles in the Apollo and Space Shuttle Programs. He was made responsible for all engineering and research at JSC following the successful completion of the space shuttle orbital flight tests. He served as JSC director from 1986 to 1993, and was acting deputy administrator of NASA from March 1992 to March 1993.

He has continued to serve as a special consultant to NASA Administrator Daniel Goldin on human space flight, research and technology.

His previous NASA honors include the Presidential Rank of Distinguished Executive and three Distinguished Service Medals.

Cost to attend the banquet is \$17. For reservations and information, contact Marcia Taylor at x30195 by May 31.

Hubble allows closer look at unusual supernova

(Continued from Page 1)

rings appear to be mirror imaged, and why they appear to be symmetrical about a point offset from the center of the explosion.

From previous HST observations and images at lower resolution taken at ground-based observatories, astronomers had expected to see an hourglass-shaped bubble being blown into space by the supernova's progenitor star. "The rings are probably on the surface of the hourglass shape," Burrows said.

The hourglass was formed by a wind of slow-moving gas that was ejected by the star when it was a red supergiant, and a much faster wind of gas that followed during the sub-

sequent blue supergiant stage. The hourglass was produced by the fact that the stellar wind from the red giant was denser in the equatorial plane of the star. When the star reached the blue supergiant stage, the faster winds tended to break out at the poles of the star.

The supernova is 169,000 light years away, and lies in the dwarf galaxy called the Large Magellanic Cloud, which can be seen from the southern hemisphere.

Supernova 1994 I in M51, located 20 million light-years away in the constellation Canes Venatici, was discovered by amateur astronomers on April 2, 1994, and has been the target of investigations by astron-

omers using ground-based optical and radio telescopes.

Previous observations show that this is a very unusual supernova, called "Type Ic," for which very few examples have been studied carefully.

Following initial observations with the International Ultraviolet Explorer satellite, which demonstrated that the supernova could be detected in the ultraviolet, a preplanned series of observations was initiated by the international Supernova Intensive Survey team, headed by Dr. Robert P. Kirshner of the Harvard-Smithsonian Center for Astrophysics.

The SINS group is using HST to study supernovae in the ultraviolet

shortly after they are discovered, and at optical wavelengths as they become too faint to monitor from the ground. They hope to learn which stars explode as supernovae, what chemical elements are ejected by the eruption, and how to use these bright events as yardsticks for measuring the size of the universe.

The HST has the unique capability of being able to image and to measure the spectra of distant supernovae in ultraviolet light. As the M51 supernova ages, HST will see more deeply into the interior of the exploded star. This will allow astronomers to probe the chemical composition of the debris and to learn more about the type of star that exploded.



NASA Photo

This view of the whirlpool galaxy M51, 20 million light-years away, shows supernova 1994-I.

Cool suit advances eyed

(Continued from Page 1)

sweat glands. It has also found applications in hot environments where body heat dissipation is difficult, such as cooling race car drivers and others in the athletic industry, patients of post-surgical hypothermia therapy, and soldiers in the Persian Gulf War.

"President Clinton is committed to working with the non-profit community to forge partnerships," Goldin said. "One of NASA's basic values and operating principles is to be responsible to the American public. This new partnership with MSA, and the promise of helping thousands of MS

patients using our technology assets, inspires our missions and motivates our workforce."

President Clinton created a Non-profit Liaison Network, comprised of 25 Administration officials from every principal department and most agencies, to strengthen partnerships between government and the non-profit sector to support the work of service groups.

The main mission of NASA's National Service Office is to use the agency's resources to address pressing social needs of the Nation, particularly in education public safety and the environment.

Space News Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the Public Affairs Office for all space center employees.

Dates and Data submissions are due Wednesdays, eight working days before the desired date of publication.

Editor Kelly Humphries
Associate Editor Kari Fluegel
Associate Editor Eileen Hawley

Solar panels bound for Russia

(Continued from Page 1)

team is structured as an Integrated Product Team consisting of Lewis Research Center; Rockwell International's Rocketdyne Division, Canoga Park, Calif.; Lockheed Missiles and Space Corp., Sunnyvale, Calif.; and NPO-Energia, Kaliningrad. The IPT concept, being incorporated throughout the station program, provides the communication, flexibility and buy-in of all team members and is critical to producing flight hardware quicker for lower cost. The Cooperative Solar Array project timeline will be less than two years from inception to deployment of the jointly produced array, making it one of the

first pieces of hardware to be launched.

As the largest international scientific and technology development ever undertaken, the station will bring together resources from the United States, Russia, member nations of the European Space Agency, Canada and Japan. The first phase of the U.S./Russian program is a series of joint shuttle/Mir space missions that will allow the United States to perform longer duration science experiments and verify station hardware concepts. The International Space Station will be assembled on-orbit with human-tended operations beginning in June 1998.